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Computer Currents

Bi-Weekly Since 1986

November 1994, Boston Edition Vol. 9 No. 11

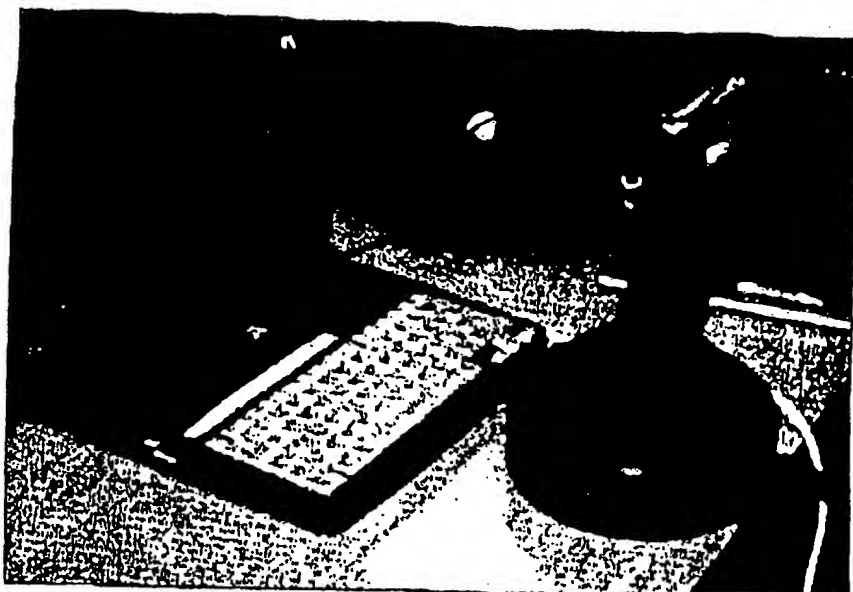
Taking a Joystick Ride

By TIM SCANNELL

Joysticks are a lot like shoes. They come in all sizes, shapes and colors, but ultimately your purchase decision is based on comfort. You don't buy shoes without first walking around in them and you don't buy a joystick until you've wrapped your hands around it and taken it for a spin.

Most joysticks are pretty similar, except for a few extra bells and whistles and perhaps a faster and better-placed trigger button. But all this is about to change, thanks to a relatively new company that's about to unveil a radical new joystick technology. This new technology not only lets you drive, race, and fly, but it also lets you feel the "feel" of a virtual road as you drive a race car, the acceleration as you push your jet to Mach 2, and the jarring smack of a well-placed punch.

The source of this rock 'em sock 'em joystick? Exos, Inc., a tiny start-up located in Woburn, MA. The



ROCK 'EM SOCK 'EM JOYSTICK: Exos Inc.'s \$100 joystick imparts the "feel" of a virtual road as you drive a race car, the acceleration as you push your jet to Mach 2, and the jarring smack of a well-placed punch.

proprietary microprocessor and software. When programmed to interact with a video game, the joystick translates actions – such as driving down a bumpy road or punching a boxer – into forces that are felt through the joystick, which juts up from the center of the device. For example, you might feel the resistance that a pilot encounters when pulling out of a dive, or the skidding sensation when a car hits a patch of ice on the road.

THE COMPUTERIZED TOUCH

The technology was developed by Dr. Beth A. Marcus, an expert in touch feedback and human touch perception, who began developing high-end "haptic" systems while she was a researcher at Arthur D. Little, Inc. in Cambridge, MA. These touch-based systems included astronaut simulators developed for NASA and U.S. Air Force flight simulators. Marcus even designed a surgical simulator that let doctors "feel" their way through a human body during a virtual reality surgical session. Although Exos still designs pricey simulation and robotics systems, the company decided early this year to concentrate full-time on the computer entertainment industry.

The joystick's proprietary software uses a technique called "haptic compression," although Marcus and her small team like to refer to it as the "language of touch," so the core technology is more easily understood by software developers who will use it in developing and enhancing video games. In fact, most video games can be adapted to use the software in just a day or two. Exos has applied for several patents on the joystick's software and microprocessor in hopes of establishing a new industry standard.

SIGHT, SOUND, AND TOUCH

"Today there is vision and sound, but no touch. Nobody's been able to reproduce its subtleties," explained Marcus with the enthusiasm of a mother telling you about her child. "The market is pushing in our direction and we want to be the standard."

Unlike current joysticks, which are programmed to jiggle at the right moments – such as when a jet fighter is hit with a missile – the Exos controller is fully interactive and provides real-time responses to each move a player makes during a game. "[Other products] may be able to impart

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vibration, but they can't generate continuously varying force effects that correspond to reality the way we can," said Marcus.

Even more remarkable, Exos expects to sell its state-of-the-art joystick for about \$100. The company presently has about six prototype joysticks, which it has shown to manufacturers, potential partners in Japan, and to trade-show attendees at events like the Consumer Electronics Show.

There are no comparable devices currently on the market. A few vendors, such as Logitech, have developed simple "on/off" touch systems, but the products never really lived up to expectations. "You have to have a sense of immersion when you're in a virtual reality program or computer game," explained Exos president Carl Muscari. "It has to involve more and more senses, so you more easily suspend disbelief."

According to Muscari, there is a relentless appetite for new and improved games, and game players are becoming more sophisticated. "There is also an undeniable, major trend in the direction of increased realism, which fits us just dandy because the next logical step is touch."

BEHIND THE WHEEL

I had a chance to test drive an Exos joystick. It does indeed add a visceral dimension — and added challenges — to video games. In one demo, I had to direct a small mythical character called a "monkey king" over some rough and slippery terrain. In another, I felt the G-forces push against the joystick as I accelerated. Using the haptic joystick I was even able to enter a dark room, "feel around" for objects, and trace their edges.

If all of this sounds like yet another approach to virtual reality, that's because Exos got its start as a VR company. Among the systems developed for NASA and others were a robotic hand and an exoskeletal arm (hence the name Exos), which allowed users to manipulate virtual objects such as a cube or sphere. Such systems are necessary for training astronauts to assemble NASA's vaunted space station in zero gravity.

Major game companies like Sega have already approached Exos and plan to use the company's technology in upcoming arcade games, especially those involving race cars. The first wave should hit the arcades sometime next year, said

Muscari. The company has also developed a steering wheel for a major developer of virtual reality PC games. Other possibilities include a feedback golf game that would let you feel the resistance as a club swings through the air and cracks into a golf ball.

"We can apply force and touch technology to anything that you interact with in a game," said Marcus. "And a whole lot of other things you

never thought about." ★

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